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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,263	12/28/2006	Michitsugu Mori	292877US2PCT	5680

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EXAMINER	
DUNLAP, JONATHAN M	

ART UNIT	PAPER NUMBER
2855	

NOTIFICATION DATE	DELIVERY MODE
05/13/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/584,263	MORI ET AL.	
	Examiner	Art Unit	
	Jonathan Dunlap	2855	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 March 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-6,8 and 9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-2, 4-6 and 8-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/9/09 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-2, 5-6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. (JP 2003-130699), Takeda, in view of Huang (PG-PUB 2002/0011120 A1), Bindal (NPL – Transducers for Ultrasonic Flaw Detection) and Takeda et al. (NPL - Flow Mapping of the Mercury Flow), Takeda II.

Considering claims 1 and 9, Takeda discloses an ultrasonic flowmeter for measuring a flow rate of a fluid to be measured, comprising:

- an ultrasonic transducer 20 including:

- an ultrasonic transmitter 15 for launching ultrasonic pulses of a prescribed frequency into the fluid 12 to be measured in fluid pipe 11 from the ultrasonic transducer 20 along a measurement line ML (Drawing 1; [0033-37]);

- a receiver 27 for receiving ultrasonic echoes reflected from a measurement region among the ultrasonic pulses incident into the fluid 12 to be measured (Drawing 1; [0038]);

- a flow velocity distribution measurement means 16 for measuring flow velocity distribution of the fluid to be measured in the measurement region based on the received ultrasonic echoes ([0034]; [0052-54]);

- a flow rate operation means 17 for calculating a flow rate of the fluid to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured ([0052-58]);

- a material 35 for fixing said ultrasonic transducer 20 to the outer surface of the fluid pipe 11 for the fluid 12 to be measured (Drawing 1; [0048]);

- the prescribed frequency is determined by:

  - determining a distance of wave propagation from the outer surface of the fluid pipe to an inner surface of the fluid pipe ([0039]); and

  - setting the prescribed frequency as a frequency of an ultrasonic wave for which the distance of wave propagation from the outer surface of the fluid pipe to the inner surface of the fluid pipe is an

integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured ([0039]).

The invention by Takeda fails to disclose that the transducer is fixed on a wedge such that at the prescribed frequency, the distance from the transducer, through the wedge to the outer surface of the fluid pipe is an integral multiple of a half-wave length of the prescribed frequency, wherein the distance from the ultrasonic transducer in a direct line to the outer surface of the fluid pipe is longer than the dead zone distance, found by multiplying the velocity of the wave through the wedge by the time of the dead zone of the transducer, and wherein the wedge and the pipe wall are separate elements such that the contact surface there between forms an incidence point for the ultrasonic wave.

However, Huang teaches:

- wherein the transducer 30 is fixed on the wedge 36 (Figure 2; [0042]), and
- wherein the wedge 36 and the outer surface of the pipe wall are separate elements such that the outer surface of the pipe wall forms an incidence point for an ultrasonic wave transmitted from the ultrasonic transducer (Figure 7; [0046]; [0075-76]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a wedge to fix the transducer onto the pipe wall in the invention by Takeda, as taught by Huang. The motivation for doing so is that the wedge sets a predetermined angle for the initial transmission of the ultrasonic wave

while also providing a transmission path from the transducer to the pipe wall. Furthermore, the use of the wedge allows the meter to maintain a compact and removable structure ([0015]; [0039]; [0042]).

The invention by Takeda, as modified by Huang, fails to disclose that the distance from the ultrasonic transducer in a direct line to the outer surface of the fluid pipe contacting the wedge is made longer than a distance obtained from multiplying a velocity of the ultrasonic wave penetrating through the wedge by a time of dead zone that an ultrasonic oscillator of the ultrasonic transducer carriers.

However, Bindal teaches that within the dead zone distance, an ultrasonic transceiver cannot receive reflected echoes (Page 54).

Therefore, it would have been obvious, if not inherently disclosed already by the 20-70mm distance of transmission block in Huang, to one of ordinary skill in the art at the time the invention was made to make the distance between the transducer and the outer surface of the pipe wall longer than the dead zone distance in the invention by Takeda, as modified by Huang. The invention by Takeda, as modified by Huang relies on detecting liquid "slugs" in fluid flow to determine flow rates of dual-phase fluids in a conduit ([0037]; Figure 7). The inability to detect these slugs would reduce the efficiently of the invention and therefore, it would have been obvious to improve efficiency by permitting the transceiver to switch from transmitter to receiver before the ultrasonic wave can be reflected by a slug inside of the pipe.

The invention by Takeda discloses the use of the pipe wall distance to set the frequency of the ultrasonic transducer so that the distance effectively becomes an

integer multiple of a 1/2 wavelength of the frequency of transmission, but Takeda fails to disclose that the wedge distance is also an integer multiple of a 1/2 wavelength of the frequency of transmission.

The invention by Huang teaches the thickness of the transmission path in the wedge is variable between 20 and 70mm ([0042]).

However, the invention by Takeda II, teaches setting a transmission distance to an integer multiple of a ½ wavelength of an ultrasonic wave incident into the fluid to be measured (Page 162).

The invention by Takeda has disclosed the advantage of having the frequency set so that the pipe wall thickness is a ½ wavelength of the ultimate frequency. The invention by Huang teaches that the wedge thickness can be adjusted. The invention by Takeda II further teaches that the maximum transmission efficiency between any two materials is solely based on the distance to wavelength of frequency being a ratio of an integer to 2. The invention by Takeda II mentions that the distance of consideration, by way of example, is the pipe wall, however, this is a non-limiting example since the transmission efficiency equation holds standard for the transmission between two materials. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the distance of transmission of an ultrasonic wave through a wedge to an integer multiple of a ½ wavelength of the transmission frequency of the ultrasonic transceiver so as to obtain maximum transmission efficiency.

Considering claims 2 and 6, the invention by Takeda fails to disclose explicitly that the wedge contact surface is fitted to equal the curvature of the fluid pipe.

7. However, Huang teaches that the wedge contact surface is equal to the curvature of the fluid pipe ([0046]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a contact surface of equal curvature to that of the fluid pipe as taught by Huang. The motivation for doing so is found in the teachings of Huang, "an angled wedge with a contact face fitted to the pipe curvature [allows] efficient energy transmission along the axial direction of the pipe" (**[0046]**).

Considering claim 5, Takeda discloses a wedge for an ultrasonic flowmeter for measuring a flow rate of a fluid to be measured, comprising:

- an ultrasonic transducer 20 including:
    - an ultrasonic transmitter 15 for launching ultrasonic pulses of a prescribed frequency into the fluid 12 to be measured in fluid pipe 11 from the ultrasonic transducer 20 along a measurement line ML (Drawing 1; [0033-37]);
    - a receiver 27 for receiving ultrasonic echoes reflected from a measurement region among the ultrasonic pulses incident into the fluid 12 to be measured (Drawing 1; [0038]);

- a flow velocity distribution measurement means 16 for measuring flow velocity distribution of the fluid to be measured in the measurement region based on the received ultrasonic echoes ([0034]; [0052-54]);
- a flow rate operation means 17 for calculating a flow rate of the fluid to be measured in the measurement region based on the flow velocity distribution of the fluid to be measured ([0052-58]);
- a material 35 for fixing said ultrasonic transducer 20 to the outer surface of the fluid pipe 11 for the fluid 12 to be measured (Drawing 1; [0048]);
- the prescribed frequency is determined by:
    - determining a distance of wave propagation from the outer surface of the fluid pipe to an inner surface of the fluid pipe ([0039]); and
    - setting the prescribed frequency as a frequency of an ultrasonic wave for which the distance of wave propagation from the outer surface of the fluid pipe to the inner surface of the fluid pipe is an integral multiple of a half-wave length of an ultrasonic wave incident into the fluid to be measured ([0039]).

The invention by Takeda fails to disclose a fixation unit configured to fix said ultrasonic transducer to the fluid pipe relating to the fluid to be measure, an ultrasonic transmitting unit fixed to the fixation unit and to the outer surface of the fluid pipe, that the transducer is fixed on a wedge such that at the prescribed frequency, the distance from the transducer, through the wedge to the outer surface of the fluid pipe is an

integral multiple of a half-wave length of the prescribed frequency, wherein the distance from the ultrasonic transducer in a direct line to the outer surface of the fluid pipe is longer than the dead zone distance, found by multiplying the velocity of the wave through the wedge by the time of the dead zone of the transducer, and wherein the wedge and the pipe wall are separate elements such that the contact surface there between forms an incidence point for the ultrasonic wave.

However, Huang teaches:

- a wedge 36 (Figure 2);
- a fixation unit 10 (Figure 2; [0041-42]);
- an ultrasonic transmitting unit fixed to the fixation and to the outer surface of the fluid pipe (Figure 2; [0041-42]);
- wherein the transducer 30 is fixed on the wedge 36 (Figure 2; [0042]), and
- wherein the wedge 36 and the outer surface of the pipe wall are separate elements such that the outer surface of the pipe wall forms an incidence point for an ultrasonic wave transmitted from the ultrasonic transducer (Figure 7; [0046]; [0075-76]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a wedge to fix the transducer onto the pipe wall in the invention by Takeda, as taught by Huang. The motivation for doing so is that the wedge sets a predetermined angle for the initial transmission of the ultrasonic wave while also providing a transmission path from the transducer to the pipe wall.

Furthermore, the use of the wedge allows the meter to maintain a compact and removable structure ([0015]; [0039]; [0042]).

The invention by Takeda, as modified by Huang, fails to disclose that the distance from the ultrasonic transducer in a direct line to the outer surface of the fluid pipe contacting the wedge is made longer than a distance obtained from multiplying a velocity of the ultrasonic wave penetrating through the wedge by a time of dead zone that an ultrasonic oscillator of the ultrasonic transducer carriers.

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Therefore, it would have been obvious, if not inherently disclosed already by the 20-70mm distance of transmission block in Huang, to one of ordinary skill in the art at the time the invention was made to make the distance between the transducer and the outer surface of the pipe wall longer than the dead zone distance in the invention by Takeda, as modified by Huang. The invention by Takeda, as modified by Huang relies on detecting liquid "slugs" in fluid flow to determine flow rates of dual-phase fluids in a conduit ([0037]; Figure 7). The inability to detect these slugs would reduce the efficiently of the invention and therefore, it would have been obvious to improve efficiency by permitting the transceiver to switch from transmitter to receiver before the ultrasonic wave can be reflected by a slug inside of the pipe.

The invention by Takeda discloses the use of the pipe wall distance to set the frequency of the ultrasonic transducer so that the distance effectively becomes an integer multiple of a 1/2 wavelength of the frequency of transmission, but Takeda fails to

disclose that the wedge distance is also an integer multiple of a 1/2 wavelength of the frequency of transmission.

The invention by Huang teaches the thickness of the transmission path in the wedge is variable between 20 and 70mm ([0042]).

However, the invention by Takeda II, teaches setting a transmission distance to an integer multiple of a ½ wavelength of an ultrasonic wave incident into the fluid to be measured (Page 162).

The invention by Takeda has disclosed the advantage of having the frequency set so that the pipe wall thickness is a ½ wavelength of the ultimate frequency. The invention by Huang teaches that the wedge thickness can be adjusted. The invention by Takeda II further teaches that the maximum transmission efficiency between any two materials is solely based on the distance to wavelength of frequency being a ratio of an integer to 2. The invention by Takeda II mentions that the distance of consideration, by way of example, is the pipe wall, however, this is a non-limiting example since the transmission efficiency equation holds standard for the transmission between two materials. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the distance of transmission of an ultrasonic wave through a wedge to an integer multiple of a ½ wavelength of the transmission frequency of the ultrasonic transceiver so as to obtain maximum transmission efficiency.

3. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. (JP 2003-130699), Takeda, in view of Huang (PG-PUB 2002/0011120

A1), Bindal (NPL – Transducers for Ultrasonic Flaw Detection) and Takeda et al. (NPL - Flow Mapping of the Mercury Flow), Takeda II as applied to claim 1 above and further in view of Soltz (U.S. Patent 4,397,194).

Considering claims 4 and 8, Takeda discloses that the material 35 is formed to reduce impedance of the wavelength through the material and to provide good switching between materials [0048] and that the pipe is made of carbon steel or stainless steel [0063],[0066].

The invention by Takeda, as modified by Huang, Bindal and Takeda II, fails to disclose that the wedge material and the pipe wall have acoustic impedance within +/- 10% of one another.

However, Solz teaches that the material of the wedge from the ultrasonic transmitter and receiver to the outer surface of the fluid pipe is made of stainless steel (Column 1, lines 40-57).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a wedge material and a pipe material of similar acoustic impedances as taught by Solz. The motivation for doing so is found in the teachings of for Takeda II (Page 161-162; Equation 2). The Examiner interprets equation 2 to show that the maximum transmission occurs at integral multiples of half-wave length regardless of the acoustic impedance relationship. However, the minimum transmission is dependant upon the relationship in the acoustic impedances. The equation shows the as the impedances approach one another the minimum efficiency approaches that of the maximum. The use of a stainless steel wedge and a steel pipe

would therefore approach a minimum efficiency that is comparable to the maximum efficiency.

Response to Arguments

Applicant's arguments with respect to claims 1-2, 4-6 and 8-9 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Dunlap whose telephone number is (571)270-1335. The examiner can normally be reached on M-F 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lisa Caputo can be reached on (571) 272-2388. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. D./
Examiner, Art Unit 2855
May 7, 2009

/Lisa M. Caputo/

Supervisory Patent Examiner, Art Unit 2855